

Claims

What is claimed is:

1. A cooling system comprising:

multiple coolant conditioning units (CCUs), each CCU at least some coolant conditioning units of the multiple CCUs providing system coolant to a different, associated electronics subsystem of multiple electronics subsystems to be cooled; and

wherein each CCU of the at least some CCUs comprises a heat exchanger, a first cooling loop with a control valve, and a second cooling loop, the first cooling loop receiving chilled facility coolant from a source and passing at least a portion thereof via the control valve through the heat exchanger, the second cooling loop providing cooled system coolant to the associated electronics subsystem, and expelling heat in the heat exchanger from the associated electronics subsystem to the chilled facility coolant in the first cooling loop, wherein the control valve allows regulation of facility coolant flow through the heat exchanger, thereby allowing independent control of a desired temperature of the system coolant in the second cooling loop for cooling the associated electronics subsystem.

2. The cooling system of claim 1, wherein the source of chilled facility coolant comprises a common source of chilled facility coolant supplied to the at least some CCUs.

3. The cooling system of claim 2, wherein the common source of chilled facility coolant comprises at least two source input lines and at least two source return lines, each input line and each return line servicing at least two CCUs of the multiple CCUs.

4. The cooling system of claim 1, wherein the multiple CCUs comprise multiple dedicated CCUs, wherein each dedicated CCUs is associated with a different electronics subsystem to be cooled.

5. The cooling system of claim 4, wherein the multiple electronics subsystems comprise multiple electronics racks, each electronics rack being cooled by an associated, dedicated CCU of the multiple CCUs.

6. The cooling system of claim 1, wherein the multiple CCUs comprise multiple CCU pairs, each CCU pair comprising a dedicated CCU and a redundant dedicated CCU for cooling a different, associated electronics subsystem of the multiple electronics subsystems.

7. The cooling system of claim 6, further comprising a controller for monitoring operation of the CCU pairs and upon detection of a failure in a dedicated CCU for automatically switching to the redundant dedicated CCU of the CCU pair having the failure to ensure continued cooling of the associated electronics subsystem.

8. The cooling system of claim 7, further comprising shutoff valves coupled to the dedicated CCU and the redundant dedicated CCU of each CCU pair of the multiple CCU pairs for selectively directing chilled facility coolant flow through one of the CCUs of the CCU pair.

9. The cooling system of claim 7, further comprising redundant facility coolant supply lines and redundant facility coolant return lines, wherein chilled facility coolant can be automatically switched from one supply line to another supply line or from one return line to another return line upon detection of a failure in any one of the lines.

10. The cooling system of claim 6, further comprising a controller and a redundant controller for monitoring operation of the CCU pairs, the redundant controller functioning in place of the controller upon detection of a failure in the controller.

11. The cooling system of claim 1, wherein each CCU of the at least some CCUs further includes a reservoir in series with the second cooling loop for ensuring an adequate supply of system coolant flow through the second cooling loop.

12. The cooling system of claim 1, further comprising an external system coolant reservoir shared by at least two CCUs of the at least some CCUs for ensuring sufficient system coolant flow through the second cooling loop of each CCU of the at least two CCUs.

13. The cooling system of claim 12, wherein the external system coolant reservoir provides system coolant to the second cooling loop of each CCU of the at least some CCUs as needed.

14. The cooling system of claim 13, wherein a different supply line connects the external system coolant reservoir to the second cooling loop of each CCU of the at least some CCUs, and wherein a fluid communication path failure in one supply line or one second cooling loop only affects the CCU having the failing supply line or failing second cooling loop.

15. The cooling system of claim 13, wherein a common supply line from the external system coolant reservoir supplies the at least two CCUs with additional system coolant to the second cooling loop thereof, and wherein each second cooling loop of the at least two CCUs is coupled to the common supply line via an upwardly extending branch line which continues to hold system coolant notwithstanding removal of system coolant from the common supply line.

16. A cooled electronics system comprising:

multiple electronics subsystems; ✓

multiple coolant conditioning units CCUs, each CCU of the multiple CCUs providing system coolant to a different, associated electronics subsystem of the multiple electronics subsystems; and

wherein each CCU of the multiple CCUs comprises a heat exchanger, a first cooling loop with a control valve, and a second cooling loop, the first cooling loop receiving chilled facility coolant from a source and passing at least a portion thereof via the control valve through the heat exchanger, the second cooling loop providing cooled system coolant to the associated electronics subsystem, and expelling heat in the heat exchanger from the associated electronics subsystem to the chilled facility coolant in the first cooling loop, wherein the control valve allows regulation of facility coolant flow through the heat exchanger, thereby allowing independent control of temperature of the system coolant in the second cooling loop for cooling the associated electronics subsystem.

17. The cooled electronics system of claim 16, wherein the multiple electronics subsystems comprise multiple electronics racks.

18. The cooled electronics system of claim 16, wherein the source of chilled facility coolant comprises a common source of chilled facility service coolant, and wherein at least two source input lines and at least two source return lines are provided coupled between the source and the multiple CCUs, each source input line and each source return line servicing at least two CCUs of the multiple CCU's.

19. The cooled electronics system of claim 16, wherein the multiple CCUs comprise multiple CCU pairs, each CCU pair comprising a dedicated CCU and a redundant dedicated CCU for cooling a different, associated electronics subsystem of the multiple electronics subsystems.

20. The cooled electronics system of claim 19, further comprising a controller for monitoring operation of the CCU pairs and upon detection of a failure in a dedicated CCU for automatically switching to the redundant dedicated CCU for the CCU pair having the failure to ensure continued cooling of the associated electronics subsystem.

21. The cooled electronics system of claim 20, further comprising shutoff valves coupled to the dedicated CCU and the redundant CCU of each CCU pair of the multiple CCU pairs for selectively directing chilled facility coolant through one of the CCUs of the CCU pair.

22. The cooled electronics system of claim 20, further comprising redundant facility coolant supply lines and redundant facility coolant return lines, wherein chilled facility coolant can be switched from one supply line to another supply line or from one return line to another return line upon detection of a failure in one of the lines.

23. The cooled electronics system of claim 19, further comprising a redundant controller for monitoring operation of the CCU pairs, the redundant controller functioning in place of the controller upon detection of a failure in the controller.

24. The cooled electronics system of claim 16, wherein each CCU of at least some CCUs of the multiple CCUs further includes a reservoir in series with the second cooling loop for ensuring adequate system coolant flow through the second cooling loop.

25. The cooled electronics system of claim 16, further comprising an external system coolant reservoir shared by at least two CCUs of the multiple CCUs for ensuring sufficient system coolant flow through the second cooling loop of each CCU of the at least two CCUs.

26. The cooled electronics system of claim 25, wherein a different supply line connects the external system coolant reservoir to the second cooling loop of each CCU of the at least two CCUs, and wherein a fluid communication path failure in one supply line or one second cooling loop only affects the CCU having the failing supply line or failing second cooling loop.

27. The cooled electronics system of claim 25, wherein a common supply line from the external system coolant reservoir supplies system coolant to the second cooling loop of each of the at least two CCUs, and wherein each second cooling loop of the at least two CCUs is coupled to the common supply line via an upwardly extending branch line which continues to hold system coolant notwithstanding removal of system coolant from the common supply line.

4

28. A method for cooling multiple electronics subsystems, the method comprising:

providing multiple coolant conditioning units (CCUs), each CCU of at least some CCUs of the multiple CCUs providing system coolant to a different, associated electronics subsystem of the multiple electronics subsystems to be cooled, wherein each CCU of the at least some CCUs comprises a heat exchanger, a first cooling loop with a control valve, and a second cooling loop with system coolant;

providing, for each CCU of the at least some CCUs, chilled facility coolant to the first cooling loop from a source and passing at least a portion thereof via the control valve through the heat exchanger;

providing, for each CCU of the at least some CCUs, cooled system coolant within the second cooling loop to the associated electronics subsystem, and expelling heat in the heat exchanger from the associated electronics subsystem to the chilled facility coolant in the first cooling loop; and

wherein the control valve of the CCU allows regulation of facility coolant flow through the heat exchanger, thereby allowing independent control of a desired temperature of the system coolant in the second cooling loop for cooling the associated electronics subsystem.

29. The method of claim 28, wherein the providing of multiple CCUs comprises providing multiple CCU pairs, each CCU pair comprising a dedicated CCU and a redundant dedicated CCU for cooling a different, associated electronics subsystem of the multiple electronics subsystems.

30. The method of claim 29, further comprising monitoring operation of the CCU pairs and upon detection of a failure at a dedicated CCU, automatically switching to the redundant dedicated CCU of the CCU pair having the failure to ensure continued cooling of the associated electronics subsystem.

31. The method of claim 30, further comprising providing redundant facility supply lines and redundant facility coolant return lines, and automatically switching from one supply line to another supply line or from one return line to another return line upon detection of a failure in any one of the lines.

32. The method of claim 29, further comprising providing redundant controllers for monitoring operation of the CCU pairs, and automatically switching control to a redundant controller upon detection of a failure in one controller.

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